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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/005,363	11/08/2001	Reinhold Kraus	22750/502	7893

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EXAMINER

PICKARD, ALISON K

ART UNIT PAPER NUMBER

3676

DATE MAILED: 09/11/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/005,363

Applicant(s)

KRAUS, REINHOLD

Examiner

Alison K. Pickard

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-8 is/are rejected.
- 7) ☒ Claim(s) 9-16 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borrino (5,529,315) in view of Matsumoto (6,528,168).

Borrino discloses a mechanical seal comprising a sliding ring 100 attached to a shaft for rotation by an o-ring 158, and a non-rotating backing ring 110 attached to a housing 128 by an o-ring 124. A spring 146 presses the rings together to form a seal. Borrino discloses that the sliding ring is made of carbon and the backing ring 110 is made of silicon carbide (see col. 10, lines 20-21). Borrino does not disclose that one of the rings is made of a carbon/silicone carbide composite material. Matsumoto teaches a carbon/silicone carbide composite material that is used for sliding members because of its excellent resistance to wear and self-lubricating properties. Matsumoto teaches using a carbon substrate (i.e. ring 100) and forming a C/SiC layer on the surface. The silicon conversion rate is in a range of 50 to 30% (col. 3, lines 16-20), which falls within the 60 to 15% range required by the claims. (Likewise, the carbon content falls in the required range.) Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the carbon ring 100 of Borrino by forming the C/SiC composite material as taught by Matsumoto to provide excellent self-lubricating and wear resistance.

2. Claims 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Borrino in view of Matsumoto as applied to claims 1-4 above, and further in view of Divakar (5,834,387).

Neither Borrino nor Matsumoto disclose a silicon carbide with a pore size not greater than $60\mu\text{m}$ at porosity of 2 to 15% or the roughness values required by the claims. Divakar teaches optimum pore size, porosity, and roughness for mechanical seal members. Divakar teaches forming a silicon carbide ring with a mean pore size of not greater than $60\mu\text{m}$ (the range 50 to 500 covers 60 and below; see col. 3, lines 33-36) at a porosity of 2 to 12%, which is within 2 to 15% required by the claims. Divakar teaches that this pore size and porosity improves the rings ability to retain a hydrodynamic film and thus ensure a better seal. Therefore, it would have been obvious for one of ordinary skill in the art at the time the invention was made to modify the mechanical seal of Borrino in view of Matsumoto with the porosity and pore size taught by Divakar to ensure a better seal that retains a good hydrodynamic film and has an improved wear rate.

Allowable Subject Matter

3. Claims 9-16 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

4. The following is a statement of reasons for the indication of allowable subject matter: the prior art of record, taken as a whole, does not show nor suggest the combination of limitations required by the claims. Specifically, the prior art does not disclose a mechanical seal comprising a stationary ring and rotating ring wherein one is made of carbon/silicon carbide composite material that exhibits sealing surface properties with a roughness value of $0.005\text{-}0.07\ \mu\text{m}$ and the

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other of silicon carbide material that exhibits sealing surface properties with a roughness value of 0.002-0.03 μm . The prior art, e.g. Divakar '387, teaches that a surface roughness of 0.03 in a silicone carbide ring improves the sealing ability and wear rate. However, Divakar does not teach a surface roughness in a carbon/silicon carbide ring. And, there is no motivation, absent Applicant's own disclosure, to modify the prior art in the manner required by the claims.

Response to Arguments

5. Applicant's arguments filed 6-13-03 have been fully considered but they are not persuasive.

Regarding Applicant's argument that Borrino discloses a ring made from carbon graphite, not carbon, the claim requires the ring to be made from a "carbon and silicon carbide composite material." Carbon graphite contains carbon. The claim is not limited to just carbon and silicon carbide (i.e. it is an 'open' claim due to the use of "comprising"). Further, Borrino in view of Matsumoto discloses a ring made of a carbon/silicon carbide composite material as required by the claims. Applicant has also disclosed (in the background) that it is known to use a carbon ring with a silicon carbide ring.

Regarding Applicant's argument that Matsumoto does not disclose the combination of a carbon/silicone carbide ring and a silicon carbide ring, the test for obviousness is not whether the features of a secondary reference may be bodily incorporated into the structure of the primary reference; nor is it that the claimed invention must be expressly suggested in any one or all of the references. Rather, the test is what the combined teachings of the references would have suggested to those of ordinary skill in the art. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981). In this case, Matsumoto is being applied for its teaching of making a

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carbon/silicon carbide ring from a carbon ring. Matsumoto teaches that this composite material has an excellent wear resistance as well as oxidation resistance, impermeability, and mechanical strength. Matsumoto acknowledges the deficiencies of prior art carbon rings (such as the ring in Borrino). Matsumoto's teachings of improved resistance (etc.) provide motivation to modify the prior art ring to improve its deficiencies. As for an expectation of success, based on the teachings of Matsumoto as well as that of other prior art, such as WO '982, Ogawa '732, or Coppella '653, one of ordinary skill in the art would be confident that a C/SiC ring would provide excellent wear resistance (etc.) regardless of what it would seal against. Further, in response to applicant's arguments against the references individually (i.e. Matsumoto), one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). The combination of Borrino (which already discloses the silicon carbide ring) in view of Matsumoto (and in view of Divakar) discloses the combination of limitations required by the claims.

As stated above, the prior art does not appear to disclose sealing surface properties and roughness values for a carbon/silicon carbide composite material as required by the claims.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Alison K. Pickard whose telephone number is 703-305-0882.

The examiner can normally be reached on M-F (9-6:30), with alternate Friday's off.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Knight can be reached on 703-308-3179. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 308-1113.



Alison K. Pickard
Examiner
Art Unit 3676

AP